INFORMATION PROCESSING SYSTEM, MEDIUM,

INFORMATION PROCESSING APPARATUS, INFORMATION

PROCESSING METHOD, STORAGE MEDIUM STORING COMPUTER

READABLE PROGRAM FOR REALIZING SUCH METHOD

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BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to an information processing system for controlling the utilization of

10   digital contents, a medium, an information processing apparatus, an information processing method, and a storage medium storing a computer readable program for realizing such a method.

Description of the Related Art

15   There are recent rapid advancements on preparation and maintenance of optical fiber networks in a backbone communication network, propagation of cable television systems, practical use of satellite communications, propagation of local area networks, and the like.

20   Interconnection of communication networks is vigorously progressing. Digital contents can be exchanged worldwide via such communication networks. The digital contents include character data, audio data, still image data, moving image data, computer programs and

25   the like.

Since a digital content is made of digital information, the digital content can easily be copied.

Digital contents pose a problem of copyright protection.

In order to deal with this problem, techniques called "electronic watermark" are used. The "electronic watermark" is techniques of processing a digital content in a predetermined manner to embed optional information in a digital content. The embedded information is hereinafter called "electronic watermark information".

If copyright information is embedded in a digital content as the electronic watermark information by utilizing the electronic watermark techniques, the digital content and copyright information can be processed independently so that the copyright can be protected reliably.

A digital content embedded with electronic watermark information is received at a terminal such as a personal computer via, for example, an arbitrary communication network. If a user of a personal computer activates a preinstalled program for sampling or deriving electronic watermark information, the electronic watermark information can be sampled from the digital content. In other words, the electronic watermark information can be sampled if a user wishes to activate the sampling program.

If a malicious user utilizes a digital content without activating the sampling program or utilizes the

digital content in the environment where the sampling
program cannot be activated, the function of copyright
protection cannot be realized because the electronic
watermark information cannot be sampled from the

5   digital content.

SUMMARY OF THE INVENTION

       According to an embodiment of the invention, it is
an object to provide an information processing system

10   capable of controlling the utilization of a digital
content in accordance with electronic watermark
information sampled from the digital content, a medium,
an information processing apparatus, an information
processing method, and a storage medium storing a

15   computer readable program for realizing such a method.
       Other objects and features of the present
invention will become apparent from the following
detailed description of the embodiments when read in
conjunction with the accompanying drawings.

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BRIEF DESCRIPTION OF THE DRAWINGS
       Fig. 1 is a block diagram showing the structure of
a network system according to the invention.
       Fig. 2 is a block diagram showing the structure of

25   a digital content distribution server according a first
embodiment of the invention.
       Fig. 3 is a flow chart illustrating an operation

of the digital content distribution server according to the first embodiment of the invention.

Fig. 4 is a block diagram showing the structure of a client according to the first embodiment of the invention.

5   Fig. 5 is a flow chart illustrating an operation of the client according to the first embodiment of the invention.

Fig. 6 is a block diagram showing the structure of a digital content distribution server according to a

10   second first embodiment of the invention.

Fig. 7 is a flow chart illustrating an operation of the digital content distribution server according to the second embodiment of the invention.

15   Fig. 8 is a block diagram showing the structure of the digital content distribution server according to the second first embodiment of the invention.

Fig. 9 is a block diagram showing the structure of a client according to the second embodiment of the

20   invention.

Fig. 10 is a flow chart illustrating an operation of the client according to the second embodiment of the invention.

Fig. 11 is a block diagram showing the structure

25   of another digital content distribution server according to the invention.

Fig. 12 is a block diagram showing the structure

of a client according to the invention.

Fig. 13 is a block diagram showing the structure of a computer function of a digital content distribution server and client according to the invention.

Fig. 14 is a diagram showing an example of copyright information according to the invention.

Fig. 15 is a diagram showing an example of copyright information according to the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Embodiments of the invention will be described with reference to the accompanying drawings.

[First Embodiment]

The invention is applied, for example, to a network system 100 such as shown in Fig. 1.

As shown in Fig. 1, the network system 100 of the embodiment has a structure that a digital content distribution server 110 and a terminal 120 on a user (client) side (hereinafter simply called a "client") are interconnected by a network 130 for the communications therebetween.

In Fig. 1, although one digital content distribution server 110 and one client 120 are connected via the network 130, a plurality of servers and clients may be interconnected.

The network system 100 of the embodiment is

configured so that when a digital content is utilized, the driving program added to the digital content automatically samples the electronic watermark information embedding in the digital content.

5   The digital content in this embodiment includes character data, audio data, still image data, moving image data, computer programs and the like.

The electronic watermark information in this embodiment is copyright information embedded in a
10   digital content by using electronic watermark techniques, the copyright information being used for controlling the utilization of the digital content. The copyright information may be stored in a list storing permission information for each utilization
15   mode, such as shown in Fig. 14. A digital content utilization control unit 123 of the client 120 to be later described refers to the copyright information sampled from a digital content and controls the utilization of the digital content in accordance with
20   the permission information for each digital content utilization mode.

For example, the digital content utilization control unit 123 can control the utilization of a digital content by forcibly altering a subject file
25   attribute of the digital content by referring to the sampled copyright information.

The digital content utilization control unit 123

can also control to permit the utilization of the digital content only by a particular application, by always monitoring applications utilizing the digital contents.

5   The digital content utilization control unit 123 can also control the utilization function (e.g., read, write, print, and etc.) of the digital content by always monitoring application program interface (API) used by various applications.

10   As shown in Fig. 14, if the digital content is constituted of audio objects and video objects, it is possible to control each object constituting the digital content. For example, it is possible to control not to permit edition of audio objects by

15   invalidating API which edits audio objects, or it is possible to control to permit edition of video objects by validating API which edits video objects.

As shown in Fig. 15, copyright information may be stored in a list storing an authentication method, a

20   server uniform resource locator (URL) on the network 130 and a protocol. In this case, the digital content utilization control unit 123 controls the utilization of a digital content by accessing the server on the network 130 identified by URL by referring to the

25   copyright information sampled from the digital content, and by acquiring the permission information for each digital content utilization mode. A cipher key may be

acquired from the server to encipher the digital

content by using the cipher key and distribute the

enciphered digital content to another terminal.

A digital signature may be entered in the

5   copyright information to verify whether the sampled

copyright information is legal. In this case, a

verification station (not shown) is provided on the

network system 100, which verifies whether the sampled

copyright information is legal and notifies the

10   verification result to the client 120, a creator (not

shown) of the digital content, the content distribution

server 110 and the like.

The sampling program will be described which

automatically samples electronic watermark information

15   embedded in a digital content.

The sampling program is created in such a manner

that even if a digital content is copied, a copy of

itself (driving program) is added to the copy of the

digital content. The sampled program is automatically

20   activated when a digital content is executed. The

sampling program depends on an operation system (OS) if

the digital content is an executable file. If a

digital content is stored in a storage medium such as a

hard disc and a floppy disc, the sampling program is

25   added to the system area of the storage medium and

depends upon the hardware architecture. If a digital

content is data of particular application software, the

driving program depends upon the application software because it uses the macro functions of the application software.

Fig. 2 is a diagram showing the internal structure of the digital content distribution server 110 of the network system 100.

As shown in Fig. 2, the digital content distribution server 110 includes a digital content input unit 111, a sampling program addition unit 112, an electronic watermark embedding unit 113, and a communication unit 114.

The operation of the digital content distribution server 110 will be described with reference to Fig. 3.

Step S201: The digital content input unit 111 acquires a digital content in order to distribute it to the client 120 via the network 130. For example, this digital content was requested by the client 120 via the network 130 to the digital content distribution server 110.

Step S202: The sample program addition unit 112 adds the sampling program for sampling the electronic watermark information to the digital content acquired by the digital content input unit 111. This sampling program is so created that when the digital content is executed, the program automatically starts.

The sampling program may be embedded in the digital content by using electronic watermark

techniques.

Step S203: The electronic watermark embedding unit
113 embeds the electronic watermark information in the
digital content added with the sampling program by the
5   sampling program addition unit 112.

Step S204: The communication unit 114 transmits
the digital content added with the sampling program by
the sampling program addition unit 112 and embedded
with the electronic watermark information by the
10   electronic watermark embedding unit 113, to the client
120 via the network 130.

In this embodiment, the digital content
distribution server 110 adds the sampling program to
the digital content (Step S202), and thereafter embeds
15   the electronic watermark information (Step S203). It
is therefore possible to transmit a digital content
embedded with only the electronic watermark information
and still not embedded with the sampling program.

The embodiment is not limited only to this process
20   order. For example, the process order may be changed
in accordance with a sampling program adding method, an
electronic watermark information embedding method or
the like.

Fig. 4 shows the internal structure of the client
25   120 of the network system 100.

As shown in Fig. 4, the client 120 has a
communication unit 121, a digital content utilization

unit 122, and a digital content utilization control unit 123.

The operation of the client 120 constructed as above will be described with reference to Fig. 5.

5　　　Step S211: The communication unit 121 receives a digital content from the digital content distribution server 110 via the network 130. This digital content was embedded with the electronic watermark information and added with the electronic watermark information

10　sampling program.

Step S212: In response to an operation instruction from a user, the digital content utilization unit 122 processes (utilizes) the digital content received by the communication unit 121. In this case, at the same

15　time when the digital content is executed, the sampling program added to the digital content is activated. Therefore, at the same time when the digital content is utilized by the digital content utilization unit 122, the electronic watermark information embedded in the

20　digital content is automatically sampled.

Step S213: In accordance with the electronic watermark information automatically sampled from the digital content, the digital content utilization control unit 123 controls the utilization of the

25　digital content. The control of the digital content utilization may include inhibiting the edition of a digital content as shown in the copyright information

of Fig. 14, inhibiting the copy of a digital content, notifying the utilization of a digital content to the digital content distribution server 110 and the like. However, the embodiment is not limited only thereto.

5   In this embodiment, the utilization of a digital content is controlled by the digital content utilization control unit 123 of the client 120. The embodiment is not limited only thereto. For example, some control of a digital content may be performed by

10   the digital content utilization control unit 123 instead of making the control unit execute the whole of the control.

More specifically, the control of a digital content may be performed by both the sampling program

15   added to the digital content and the digital content utilization control unit 123 in order to take partial charges of control functions. In this case, it is possible to prevent a malicious user (illegal user) of a digital content from disabling the digital content

20   utilization control unit 123 of the client 120 and illegally utilizing the digital content.

Furthermore, rough utilization control such as permission and inhibition of utilization of a digital content may be performed by the sampling program,

25   whereas fine utilization control such as utilization contents (e.g., edition degree, edition allowed range, and etc.) of a digital content may be performed by the

digital content utilization control unit 123. More specifically, when the sampling program samples the electronic watermark information representative of "utilization inhibition" of the digital content, the

5   sampling program may control to delete the digital content from the client 120.

In this embodiment, although a digital content is distributed to the digital content distribution server 110 and client 120 via the network 130, the digital

10   content may be distributed by storing it in a storage medium such as a CD-ROM, a floppy disc, a CD-R and a DVD, not limiting only to the communication medium such as the network 130.

As described above, in this embodiment, the

15   electronic watermark information and electronic watermark information sampling program are added to a digital content, and at the same time when the digital content is utilized, the sampling program added to the digital content is automatically activated.

20   It is therefore possible to always sample the electronic watermark information embedded in the digital content and to reliably protect the copyright of the digital content.

In this embodiment, although the sampling program

25   is automatically activated when the digital content is utilized, a judgement unit for judging whether the sampling program is activated may be provided to

restrict the utilization of a digital content in accordance with the judgement result. For example, if the judgement unit judges that the sampling program was not activated, the digital content is made unable to be

5   utilized, such as deletion thereof, or a message "there is a possibility of illegal action against the digital content" is notified to the digital content distribution server 110.

[Second Embodiment]

10   The structures and operations of a digital content distribution server 110 and a client 120 of the second embodiment will be described with reference to the accompanying drawings.

        Similar to the first embodiment, the network

15   system 100 shown in Fig. 1 is applied to the second embodiment.

        Fig. 6 shows the internal structure of the digital content distribution server 110 of the second embodiment.

20   As shown in Fig. 6, the digital content distribution server 110 of the second embodiment is constituted of the constituent elements 111 to 114 shown in Fig. 2 and a program input unit 115.

        The operation of the digital content distribution

25   server 110 constructed as above will be described with reference to Figs. 7 and 8.

        Step S301: The digital content input unit 111

acquires a digital content in order to distribute it to the client 120 via the network 130. For example, this digital content was requested by the client 120 via the network 130 to the digital content distribution server

5   110.

Step S302: The electronic watermark embedding unit 113 embeds the electronic watermark information in the digital content acquired by the digital content input unit 111.

10   Step S303: The communication unit 114 transmits the digital content embedded with the electronic watermark information by the electronic watermark embedding unit 113, to the client 120 via the network 130.

15   Step S304: The program input unit 115 of the digital content distribution server 110 acquires an application program in order to distribute it over the network 130. For example, this application program was requested by the client 120 via the network 130 to the

20   digital content distribution server 110. For example, the application program is a desk top publishing (DTP) program, a viewer program or the like.

Step S305: The sample program addition unit 112 adds the sampling program for sampling the electronic

25   watermark information to the application program acquired by the program input unit 115.

This sampling program is automatically executed

when the application program is executed. The sampling

program may be embedded in the application program by

using electronic watermark techniques.

Step S306: The communication unit 114 transmits

5   the application program added with the sampling program

by the sampling program addition unit 112, to the

client 120 via the network 130.

Fig. 9 shows the internal structure of the client

120 of the second embodiment.

10   As shown in Fig. 9, the digital content

distribution server 110 of the second embodiment is

constituted of the constituent elements 121 to 123

shown in Fig. 4 and a program utilization unit 124.

The operation of the client 120 constructed as

15   above will be described with reference to Fig. 10.

Step S311: The communication unit 121 receives a

digital content and an application program transmitted

from the digital content distribution server 110 via

the network 130. This digital content was embedded

20   with the electronic watermark information, and the

application program was added with the sampling program

for sampling the electronic watermark information from

the digital content.

Step S312: In response to an operation instruction

25   from a user, the program utilization unit 124 activates

the application program received by the communication

unit 121, and the digital content utilization unit 122

processes (utilizes) the digital content received by the communication unit 121. In this case, at the same time when the application program is executed by the program utilization unit 124, the sampling program

5 added to the application program is automatically activated. Therefore, at the same time when the digital content is utilized by the digital content utilization unit 122, the electronic watermark information embedded in the digital content is

10 automatically sampled.

Step S313: In accordance with the electronic watermark information automatically sampled from the digital content, the digital content utilization control unit 123 controls the utilization of the

15 digital content. The control of the digital content utilization may include inhibiting the edition of a digital content, inhibiting the copy of a digital content, and the like. However, the embodiment is not limited only thereto.

20 In the second embodiment, the digital content distribution server 110 having the structure shown in Fig. 6 transmits separately the digital content embedded with the electronic watermark information and the application program added with the electronic

25 watermark information sampling program, to the client 120. The embodiment is not limited only thereto. For example, the integrated or combined digital content and

application program may be transmitted.

For example, a file formed typically by MS-Word combines a main portion (digital content) of Ascii code trains and a supplemental information portion

5   (application program) such as attribute information and macro of the digital content. Such a file contains a plurality of digital contents in some cases.

In such cases, as shown in Fig. 11, the digital content distribution server 110 is provided with a

10   combining unit 116 which combines the digital content embedded with copyright information output from the electronic watermark embedding unit 113 and the application program with the sampling program output from the sampling program addition unit 112, and

15   supplies the combined digital content and application program to the communication unit 114. In this manner, a file combining the digital content and application program can be distributed. The combining unit 116 can distribute a single file combining an application

20   program output from the sampling program addition unit 112 and a plurality of digital contents output from the electronic watermark embedding unit 113.

As shown in Fig. 12, in accordance with the copyright information of each digital content sampled

25   by the sampling program, the digital content utilization control unit 122 of the client 120 controls the utilization of each digital content by the program

utilization unit 124.

In this manner, even if a file contains a plurality of digital contents, the utilization control can be performed one digital content after another.

5   As described above, in this embodiment, if a digital content is utilized by using an application program such as a DTP program and a viewer program, at the same time when the application program starts, the sampling program added to the application program

10   automatically starts.

It is therefore possible to reliably sample the electronic watermark information from a digital content when the digital content is utilized by using an application program.

15   In the second embodiment, a digital content can be utilized by starting an application program added with the sampling program. The invention is not limited only to the case wherein a digital content can be utilized by directly activating an application program

20   added with the sampling program.

Recent application programs are highly sophisticated, and many applications are divided into libraries, plug-in and the like for respective functions. In such a case, the sampling program may be

25   added to the library, plug-in and the like to be activated by the application program.

Furthermore, if the sampling program is added only

to a single program, there may occur the case that this single program is not activated. In order to avoid this, the sampling program may be added to a program having a high activation frequency or to a plurality of

5   programs.

In this embodiment, although a digital content and an application program are distributed to the digital content distribution server 110 and client 120 via the network 130, the digital content and application

10   program may be distributed by storing them in a storage medium such as a CD-ROM, a floppy disc, a CD-R and a DVD, not limiting only to the communication medium such as the network 130.

[Other Embodiments]

15   It is obvious that the objects of the invention can be realized by supplying an apparatus or system with a storage medium storing software program codes realizing the functions of the host and terminal of the first and second embodiments and by making a computer

20   (or CPU or MPU) of the apparatus or system read and execute the program codes.

In this case, the software program codes themselves read from the storage medium realize the functions of the first and second embodiments.

25   Therefore, the storage medium storing the program codes constitutes the present invention.

The storage medium for storing such program codes

may be a ROM, a floppy disk, a hard disk, an optical

disk, a magneto optical disk, a CD-ROM, a CD-R, a

magnetic tape, a nonvolatile memory card, or the like.

It is obvious that the scope of the invention

5   contains the case wherein not only the functions of the

first and second embodiments are realized by executing

the program codes read by a computer but also the

functions of the first and second embodiments are

realized by making an OS or the like running on a

10   computer perform a portion or the whole of the actual

processes in accordance with the program codes.

It is obvious that the scope of the invention also

contains the case wherein the functions of the first

and second embodiments can be realized by writing the

15   program codes into a memory of a function expansion

board inserted into a computer or of a function

expansion unit connected to the computer, and

thereafter by making a CPU of the function expansion

board or function expansion unit execute a portion or

20   the whole of actual processes.

Fig. 13 shows an example of the structure of a

computer function 600. Each of the digital content

distribution server 110 and client 120 is provided with

the computer function 600, and a CPU 601 operates to

25   realize the operations of the first and second

embodiments.

As shown in Fig. 13, the compute function 600 is

realized by CPU 601, a ROM 602, a RAM 603, a keyboard

controller (KBC) 605 for a keyboard (KB) 609, a CRT

controller (CRTC) 606 for a CRT display (CRT) 610 as a

display unit, a disc controller (DKC) 607 for a hard

5   disc (HD) 611 and a floppy disc (FD) 612, and a network

interface card (NIC) 608, respectively connected by a

system bus 604 for communications among them.

The network interface card (NIC) 608 is connected

to a network 640 such as the network 130 shown in Fig.

10   1.

CPU 601 executes software stored in ROM 602 or HD

611 or software supplied from FD 612 to collectively

control the constituent elements connected to the

system bus 604.

15   CPU 601 reads a program satisfying a predetermined

process sequence from ROM 602, HD611, or FD 612 and

executes it to realize the operations of the first and

second embodiments.

RAM 603 functions as the main memory, working area

20   and the like of CPU 601. KBC 605 controls inputs

supplied from an unrepresented pointing device or the

like. CRTC 606 controls a display of CRT 610.

DKC 607 controls an access to HD 611 and FD 612

which store a boot program, various applications,

25   editor files, user files, network management programs

and predetermined programs for realizing the functions

of the embodiments. NIC 608 transfers data to and from

the apparatus or system on the network 140.